

S.N. 09/689,574

AMENDMENTS TO THE CLAIMS

Claims 1-10 (canceled)

Sub D, ~~Claim 11~~ (currently amended): An apparatus for monitoring a characteristic of a subsurface reservoir, comprising:

a tubular having an elongated body with a longitudinal axis, the tubular being adapted for permanent disposal within a borehole traversing the reservoir;
at least one antenna disposed on the exterior of the tubular with its axis at an angle in between 0 and 90 degrees with respect to the axis of the tubular to provide a measurement about a targeted orientation within the reservoir, each at least one antenna being adapted to transmit and/or receive electromagnetic energy; and
means electronics to activate the at least one antenna to ~~electronically steer the sensing direction of the~~ transmitted and/or received electromagnetic energy.

Claim 12 (original): The apparatus of claim 11, wherein the reservoir characteristic is resistivity.

Claim 13 (original): The apparatus of claim 11, wherein the at least one antenna comprises a plurality of coils having non-parallel axes.

Claim 14 (original): The apparatus of claim 11, the tubular further comprising at least one station having a reduced diameter such that a recess is formed about its external circumference, the at least one antenna being disposed in a recessed station.

Claim 15 (original): The apparatus of claim 11, wherein an insulating material is disposed between the tubular body and the at least one antenna disposed thereon.

Claim 16 (original): The apparatus of claim 11, further comprising a shield positioned on the exterior of the tubular to surround the at least one antenna disposed thereon.

Claim 17 (original): The apparatus of claim 16, wherein the shield is formed of a material providing transparency to electromagnetic energy.

Claim 18 (original): The apparatus of claim 16, wherein the shield is metallic and has at least one slot formed therein.

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Claim 19 (original): The apparatus of claim 11, the tubular further comprising at least one slot formed along the elongated body, wherein the at least one antenna is disposed on the tubular in alignment with the at least one slot.

Claim 20 (original): The apparatus of claim 11, further comprising a wireline coupled to the at least one antenna, the wireline adapted to carry a signal from or to the antenna.

Claims 21-47 (canceled)

Claim 48 (currently amended): A method for monitoring a characteristic of a subsurface reservoir, the reservoir being traversed by a borehole, comprising:

disposing a tubular within the borehole, the tubular having an elongated body with a longitudinal axis and adapted for permanent disposal within the borehole;

disposing at least one antenna on the exterior of the tubular with its axis at an angle in between 0 and 90 degrees with respect to the axis of the tubular to provide a measurement about a targeted orientation within the reservoir, each at least one antenna being adapted to transmit and/or receive electromagnetic energy; and

~~electronically steering the sensing direction of activating the at least one antenna to transmitted and/or received electromagnetic energy.~~

Claim 49 (original): The method of claim 48, wherein the reservoir characteristic is resistivity.

Claim 50 (original): The method of claim 48, wherein the at least one antenna comprises a plurality of coils having non-parallel axes.

Claim 51 (original): The method of claim 48, the tubular further comprising at least one station having a reduced diameter such that a recess is formed about its external circumference, the at least one antenna being disposed in a recessed station.

Claim 52 (original): The method of claim 48, wherein an insulating material is disposed between the tubular body and the at least one antenna disposed thereon.

Claim 53 (original): The method of claim 48, further comprising mounting a shield to the exterior of the tubular, the shield being positioned around the at least one antenna.

Claim 54 (original): The method of claim 53, wherein the shield is formed of a material providing transparency to electromagnetic energy.

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Claim 55 (original): The method of claim 53, wherein the shield is metallic and has at least one slot formed therein.

Claim 56 (original): The method of claim 48, the tubular further comprising at least one slot formed along the elongated body, wherein the at least one antenna is disposed on the tubular in alignment with the at least one slot.

Claim 57 (original): The method of claim 48, further comprising mounting a wireline on the outer surface of the tubular and connecting the at least one antenna to the wireline.

Claims 58-78 (canceled)

Claim 79 (new): An apparatus for monitoring a characteristic of a subsurface reservoir, comprising:
a tubular having an elongated body with a longitudinal axis, the tubular being adapted for permanent disposal within a borehole traversing the reservoir;
the tubular having an opening along a wall of its elongated body;
at least one antenna disposed on the exterior of the tubular near the opening and adapted to transmit or receive electromagnetic energy;
the at least one antenna having its axis at an angle with respect to the axis of the tubular to provide a measurement about a targeted orientation within the reservoir;
and
electronics to activate the at least one antenna to transmit or receive electromagnetic energy.

Claim 80 (new): The apparatus of claim 79, wherein the tubular is adapted with a recess formed about its external circumference and the at least one antenna is disposed in said recess.

Claim 81 (new): The apparatus of claim 80, wherein the opening along the wall of said tubular is located in said recess.

Claim 82 (new): The apparatus of claim 80, wherein the recess is angled with respect to the axis of the tubular.

Claim 83 (new): The apparatus of claim 82, wherein said opening is located in said recess and formed at an angle with respect to the axis of the tubular.

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~~Claim 84 (new): The apparatus of claim 79, wherein the at least one antenna comprises a plurality of coils having non-parallel axes.~~

~~Claim 85 (new): The apparatus of claim 84, wherein the at least one antenna is adapted to selectively sense or transmit electromagnetic energy in a specific orientation within the reservoir.~~

~~Claim 86 (new): The apparatus of claim 79, wherein the at least one antenna is disposed on the tubular with its axis at an angle in between 0 and 90 degrees with respect to the axis of said tubular.~~

~~Claim 87 (new): The apparatus of claim 86, wherein said opening is formed at an angle with respect to the axis of the tubular.~~

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